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REMARKS/ARGUMENTS

Reconsideration and re-examination are hereby requested.

Before discussing the claims and how they distinguish over the prior art, perhaps in might be helpful to review features of Applicant's invention in view of the Maguire and Serpek

It is first noted that the Examiner states:

"Since Maquire teaches 1750C - one would keep it at 1750C and not change it."

The Examiner also states on page 5 of the Office Action: "As to the use of a single temperature: various Maquire claims clearly refer to 'a temperature'. A fair reading of this is that it means a single temperature-not multiple temperatures as applicant incorrectly suggests."

Applicant refers to Maguire, as stated therein at column 2, beginning at line 47:

> ... A preferred mixture comprises 5.6 weight percent carbon black and 94.4 weight percent aluminum oxide. The aluminum oxide/carbon mixture is placed in an alumina crucible and is reacted in an atmosphere of flowing nitrogen at temperatures from 1550° C. to 1850°C. for up to two hours at the maximum temperature. The preferred heat treatment is in two steps. In the first step, a temperature of approximately 1550°C. is used for approximately one hour, whereby, for an appropriate ratio of alumina to carbon, the temperature unstable gamma-aluminum oxide is only partially reacted with carbon and nitrogen to form both alpha-aluminum oxide and aluminum nitride. A one hour soak at 1550°C. is sufficient to convert the proper amount of Al_2O_3 to AlN. In the second step, a temperature of 1750°C. or up to the solidus temperature of aluminum oxynitride (2140°C.), is used for approximately 40 minutes, whereby alpha-aluminum oxide and aluminum nitride combine to form cubic aluminum oxynitride.
>
> The reacted material resulting from the heat treatment is composed primarily of cubic aluminum oxynitride, but may also contain alumina and/or aluminum nitride in amounts of up to 15 weight percent such that the ratio of aluminum oxide to aluminum nitride is within the composition range of cubic aluminum oxynitride. The amounts of alumina and aluminum nitride can be controlled by the heat treatment and the amount of aluminum nitride produced in the first heating step which in turn depends on the amount of carbon in the starting mixture.
>
> For a first step utilizing the preferred one hour soak at 1550°C., except for Sample 5 which was treated at 1620°C., TABLE I illustrates the

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effect of using different amounts of carbon in the starting mixture and of different temperatures during the second step of the heat treatment.

Thus, from the above, it is clear that process described in Maguire for producing ALON powder requires a **two step** heat treatment to produce ALON powder from a mixture of alumina and carbon black, through carbo-thermal reduction. The first step occurs at 1550°C and is the conversion of the gamma alumina into a combination of alpha alumina and aluminum nitride. This step is described as requiring approximately 1 hour for full conversion. The second step occurs at 1750°C, and is the conversion of the alpha alumina and aluminum nitride into ALON. This second step is described as taking approximately 40 minutes.

Thus, the statements made by the Examiner and cited above that "Since Maquire teaches 1750°C - one would keep it at 1750°C and not change it" and "As to the use of a single temperature: various Maquire claims clearly refer to 'a temperature'. A fair reading of this is that it means a single temperature-not multiple temperatures as applicant incorrectly suggests." are not understood.

The patent by Serpek describes the use of a rotary calciner, a preferred method of continuous processing, to produce aluminum nitride from a mixture of alumina and carbon black. This represents only the **first step** of the **Maguire** process, if you adjust the ratio of the alumina and carbon black so that all of the alumina is converted into aluminum nitride. In order to complete the reaction, the powder would have to be run through a second rotary calciner at the higher temperature, to produce ALON powder. ***To reiterate, the simple application of the earlier art represents a two step process.***

Consequently, the Examiner's statement: "Since Maquire teaches 1750°C - one would keep it at 1750°C and not change it", is not understood.

In accordance with one embodiment of Applicant's invention, the ALON powder is produced in a ***single heat treatment step*** using a continuous process. APPLICANT HAS DISCOVERED THAT BY PROVIDING A CHAMBER HAVING A PROPER TEMPERATURE AND HAVING A MIXTURE COMPRISING ALUMINUM OXIDE AND CARBON THE MIXTURE AGITATED IN THE CHAMBER A ***SINGLE***

HEAT TREATMENT STEP CAN PRODUCE ALON. Rather than use a two step process, Applicant describes a ***single step*** process. This is a key difference between the earlier art and the current application. It is the combination of the continuous processing, which provides for a uniform reaction environment for the powder precursors, and the reaction times for the chemical processes described, which allow this to occur. It is this combination which is unique. The ***single step reaction can take place in MINUTES, rather than HOURS as the earlier patents claim.***

Furthermore, it is the combination of continuous processing and fast reaction times which allow the ALON powder to be produced at high rates at a low cost, required for commercialization of this material. The simple application of ***the earlier art requires two rotary calciners to be purchased*** (i.e., double the capital investment), and ***twice the processing time***. These two factors would result in roughly doubling the cost of producing ALON powder. Based on the arguments presented, the subject invention represents a significant innovation, not a trivial extension of prior art. Reconsideration is hereby requested.

NOTHING IN EITHER MAGUIRE OR SERPEK describes, suggests or recognizes that ALON can be produced by a single step process.

In accordance with another embodiment of the invention, the ALON is made in a semi-continuous or somewhat batch process with the chamber ramped to a proper temperature. As pointed out in the patent application:" ... at ramp rate of greater than 10-20 °C/min to a soak temperature of about 1700-1900 °C, preferably about 1825 °C. The soak time is about 10-30 minutes, preferably about 15 minutes". The semi-continuous process can shorten the time needed to synthesize multiple batches of ALON, for example, by reducing the time needed to ramp the furnace to a soak temperature, the time needed for the furnace to cool, and the time needed to re-load the retort and to remove the formed ALON from the retort. The semi-continuous process also provides convenient handling of reactants and products.

Thus, in accordance with one embodiment of Applicant's invention, the ALON powder is produced in a ***single heat treatment step*** using a continuous process. Rather than use a two step process, Applicant describes a ***single step*** process.

Referring now to the claims:

Claim 32 points out that " particles with the predetermined temperature of the chamber being maintained constant at the predetermined temperature during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

Claim 34 points out that "with the predetermined temperature of the chamber being maintained constant at the predetermined temperature during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride"

Claim 36 points out that:" with the temperature of the chamber being maintained constant at the provided predetermined temperature during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

Claim 38 points out that: "while passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the chamber having a temperature about 1700-1900°C during conversion of the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

Claim 39 points out that: " with the chamber having a temperature selected to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

Claim 41 points out that:" with the temperature of the chamber being maintained to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

Claim 47 points out that:" with the temperature of the chamber being maintained to continuously convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

New claim 53 points out that the process includes: "(c) reacting aluminum oxide particles and carbon particles continuously introduced into the provided chamber while continuously mixing and heating the aluminum oxide particles and carbon particles within the provided chamber and while passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the heating of the chamber being maintained to convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride."

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New claim 54 points out that the process includes: "(c) reacting aluminum oxide particles and carbon particles continuously introduced into the provided chamber while heating and continuously mixing the aluminum oxide particles and carbon particles within the provided chamber and while passing nitrogen gas over the mixing aluminum oxide particles and carbon particles with the heating of the chamber being selected to continuously convert the aluminum oxide particles, carbon particles and nitrogen into the aluminum oxynitride".

In the event any additional fee is required, please charge such amount to Patent and Trademark Office Deposit Account No. 50-3192.

Respectfully submitted,

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Date

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